

Technical Viewpoint in Medical Education

Risks associated with the citation of retracted medical literature

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Abstract

If ever there was any field of research that carried weight within society, it would most certainly and arguably be medical research. The validity of medical research, transmitted via the medical literature and propagated as having been validated by robust peer review, tends to be associated with bibliometric platforms such as PubMed or databases such as Web of Science or Scopus. An unknown fraction of the existent medical literature is likely unreliable, either due to errors, fraud or misconduct, and in extreme cases, such papers are retracted. A general rule of thumb is that such papers should not be cited, but for several reasons, the citation of retracted medical literature is not always avoidable. This paper reflects on the citation of the medical literature, using several case studies to draw readers' awareness to some of the issues, discussion points, and risks – bibliometric and practical – associated with the citation of retracted medical literature. The primary objective of this paper is to draw the attention of academics in the field of medicine to the risks associated with citing retracted literature.

Take-home message: The citation of retracted medical literature carries risks, both bibliometric and practical.

Key words: Citations; database credibility; fraud; misconduct; reference validation; retraction.

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INTRODUCTION

A decade ago, about 0.02% of the academic literature had been retracted, a value that was based on a sample of 4,449 PubMed-indexed papers that were retracted between 1928 and 2011 [1]. A decade later, and at around 35,000 retractions, the rate is about 0.1% [2]. Registering a retraction rate of 0.25% in 1082 PubMed-indexed retracted papers in 2013-2016, misconduct was noted as the greatest reason for those retractions [3]. An actual or potential risk of citing retracted medical literature relates to invalid clinical outcomes that themselves could impact patients' treatments [4]. Consequently, a medical paper that might have been retracted due to plagiarism or duplication might still have valid medical information, so such retracted papers would not necessarily pose a "health risk" *per se*, whereas medical papers that claim the efficiency of a drug, treatment or clinical trial, but in which data has been falsified or false claims have otherwise been made, could portray a result or efficiency that might not be medically true. The objective of this paper is to draw the attention of academics in the field of medicine to the risks associated with citing retracted literature.

Select case studies: Historical bibliometric perspective

Select high-profile cases, in terms of the media attention and number of citations that these retracted medical papers have accrued, are highlighted in this section. To appreciate the literature in a more meaningful and interesting way, data from a 2013 bibliometric analysis of nine highly cited retracted papers, mostly related to medicine [5], was compared to their current citation counts [6–14] (Table 1).

In all cases, a thorough scientometric analysis would be needed to appreciate how many of the citing papers continue to cite the retracted paper as being scientifically valid versus citations that discuss the educational nature of the paper, for example in this paper, and within the wider context of medical publishing ethics. What can be broadly appreciated in all cases is that even post-retraction, these retracted papers continue to accumulate high volumes of citations, some very highly, such as the Wakefield et al. study [6].

Table 1. Citation counts of high-profile medical papers, comparing Web of Science-based values in 2012 [5] versus Google Scholar-based values in 2022 (November 15).

Retracted paper	Medical field(s) covered or affected	Citation count according to [5]	Current citation count (crude*)
[6]	Immunology; vaccinations, autism	740	4087
[7]	Stem cells; hematopoiesis	727	1892
[8]	Diabetes; lipidology	659	3314
[9]	RCT; diabetes, nephrology; hypertension	618	1436
[10]	Multidrug resistance; ABC transporters	512	893
[11]	Cancer; oncology; immunology; immunotherapy	492	1058
[12]	Stem cells; cancer; oncology	433	1481
[13]	Stem cells; cancer; oncology	391	653
[14]	Stem cells	375	1031

RCT, random clinical trial; * Likely including duplicates and false positives

Perspectives from three recent analyses

Three recent analyses are summarized in this section in order to appreciate some of the current debate about the citation of retracted medical literature.

A recent analysis of 420 citations between 2009 and 2019 of 25 retracted papers by the author Scott S. Ruben in the field of anaesthesiology made three observations: 1) relative to non-retracted neighboring papers in the same journals, the Ruben retractions accrued 92% more citations; 2) 60% of the papers citing those retracted papers did not indicate the retracted status of the papers; 3) 31% of citations to those retracted papers in journals with a high Clarivate journal impact factor (JIF) (JIF > 50) indicated the retracted status of the paper versus 21% in journals with a JIF < 50 [15].

Another recent analysis assessed how 88 publications (mainly systematic reviews and clinical guidelines) had cited 27 retracted random clinical trials (RCTs), finding that: 1) 82 citing papers indexed in the Web of Science and/or Scopus had themselves accumulated about 10,900 citations; 2) only 25 of the citing papers completed a risk of bias assessment, 14 of them indicating the findings of these RCTs as a low risk; 3) none of the 88 papers indicated any concerns related to publication integrity; 4) findings in 51% of the citing papers would likely have changed had the retracted RCT reports been removed [16]. Regarding the first point, the cumulative citations of papers that cite retracted papers serve as downstream “vehicles” that can “popularize” retracted papers or their findings, thus offering an indirect form of legitimization to illegitimate retracted papers [17].

In a third recent analysis in the field of anaesthesiology and intensive care, the authors attempted to contact the corresponding authors of 478 retracted articles until August 2021, and

found that: 1) only 30% of 1297 corresponding authors responded; 2) 94% of respondents indicated that no issue was raised by either peer reviewers or editors; 3) 61% of respondents cited retracted papers because the journal website and/or database were insufficiently labelled while 11% used an outdated archived copy; 4) 2% of respondents cited retracted literature because “Retraction is/was not considered as an issue” [18]. The lack of responses by corresponding authors undermines their responsibility, at least according to the responsibilities associated with authorship as defined by clause 4 of the *International Committee of the Medical Journal Editors (ICMJE)* recommendations [19]. The second point is quite surprising because it is not an author that determines whether their paper will be published. Rather, a paper’s publication is the exclusive decision of editors, who are responsible for ensuring that what they approve for publication has been fully and carefully vetted, including the absence of citation to retracted literature, or the appropriate citation to retracted literature. That procedure involves very careful screening by peer reviewers and further validation by editors [20,21].

DISCUSSION

This paper took a two-prong approach to appreciate how the citation of retracted medical literature might pose a risk, *sensu lato*, to the integrity of the medical literature. In the first approach, to gain a crude bibliometric understanding, a historical comparison was conducted, using eight high-profile papers whose citation counts were analyzed a decade ago [5], versus current citations, to appreciate how retracted papers, mainly medical, continue to accrue citations, sometimes in large volumes. The second approach was to highlight some more recent analyses of retracted medical papers to appreciate some of the concerns and discussion points by peers. Two potential risks were identified. The first is bibliometric and is related to the citation of scientifically invalidated work that has been retracted due to fraud or misconduct, in which citations confer a form of “unjust reward”, in the form of citations. The second risk pertains not only to the validity of medical findings of literature that cites retracted medical papers, especially papers that were retracted due to fraud or misconduct, but more direct health-related concerns, such as conclusions drawn from invalid RCTs, or medical advice derived from erroneous or fake data.

One of the recurring themes in the literature related to the citation of the retracted medical literature is how the retracted status of the retracted paper is not properly indicated, either on the original paper’s website, or in databases and/or bibliographic platforms. For example, 40% of 812 records associated with 144 retracted papers related to mental health did not indicate the retracted status of the paper [22], thus potentially citing authors might have unconsciously cited such papers without knowing that they were retracted. Unretracted versions of retracted papers might also be available on sites such as ResearchGate or Sci-Hub [23]. In other cases, the scientific validity of a retracted paper might not be in question despite being retracted [24].

If one considers that authors benefit directly or indirectly from citations, for example the *H*-index for authors, or the JIF or Elsevier CiteScore for journals, the argument can be made that such metrics need to be lowered or adjusted to accommodate for “invalid” citations, i.e., citations that promote invalid science need to be discounted [25,26]. To the author’s knowledge, no journal has yet retrospectively adjusted their metrics to take citations of retracted literature into account.

Study limitations

Most of the approximately 35,000 current retractions [2] are likely in the biomedical literature. This paper highlighted several historically high-profiled cases in the medical literature to exemplify how citations to these papers have increased over time. This paper does not claim the legitimacy or illegitimacy of those citations since a detailed bibliometric analysis of those citations and their corresponding retraction notices would be needed to appreciate if the citations are innocuous, for example in educational debates, or whether they rely on scientific flaws of the original retracted papers to base their conclusions, thereby invalidating their own conclusions. The citation counts provided in Table 1 are also not directly comparable (Web of Science versus Google Scholar), and the original data of the 2013 analysis [5] would be needed, as would a fresh analysis that utilizes Web of Science data to make any direct and thus comparable conclusions.

CONCLUSION

It cannot be stated that any and all retracted papers cannot or should not be cited, because there are ample valid and even academic or scholarly reasons to cite retracted literature, including medical literature [27]. However, some steps can be taken to minimize the illegitimate citation of scientifically invalid medical literature, such as: a) popularizing the debate and discussion about this topic, such as through articles such as this one, so that more medical practitioners are aware of the issues and do not treat the topic as a taboo; b) authors should carefully assess the retracted status of a paper by accessing the original source of the document, especially if copies of literature are sourced from outdated databases, libraries, websites such as ResearchGate, or pirate open access sites such as Sci-Hub; c) there needs to be careful information and database management by journals to indicate the retracted nature of papers with clear, visible text or colors, in both HTML and PDF versions of the paper; d) retraction notices need to offer complete, transparent and publicly verifiable background information about why retractions took place [28]; e) a need to change the culture of retractions in academic publishing that accepts them as a more natural part of the publication cycle but that tempers insults, slander, and shaming [29]; f) careful vetting of cited literature by peer reviewers and editors during the peer review process [20,21].

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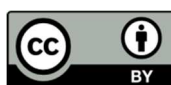
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